secured to either a socket or a connector of the backplane. Additionally, the end cap may include means through which to identify the Braille display assembly as being the last display element in a multiple line display. Each of the Braille displays in a multiple line display includes a socket and a connector to establish circuit communication between each individual backplane. As such, a display having 40 individual Braille cells may be constructed of two 20 Braille cell displays utilizing the sockets, connectors and end caps of the present invention.

The Braille display assembly in accordance with the present invention provides manufacturing cost reductions, improvements in reliability, and enhancements in the tactile experience for users. The Braille display assembly provides improvements is manufacturing while still maintaining the modularity at the Braille cell level. The novel Braille display assembly in accordance with the present invention eliminates the need for additional securing rods and associated plastic, thereby reducing the overall weight of the device. The novel self-aligning system provided by the present invention allows the tactile pins and the Braille cells to be easily maintained. The novel monolithic cell cap can be easily remove to provide access to all the individual tactile pins and buttons simultaneously. Additionally, an individual Braille cell can be removed from the Braille display and replaced or repaired without disturbing the alignment of the remaining Braille cells.

As such, the present invention provides improvements in manufacturability and maintenance of Braille display assemblies. Tactile pin maintenance and bimorph reed replacement are greatly simplified utilizing the novel frame of the present invention. Additionally, the present invention provides a tactile pin cap for multiple Braille cell assemblies, thereby eliminating the separation between each cell that is detectable by a user and considered undesirable. The user is presented with a smooth tactile surface presenting protuberants only for the tactile pins and the cursor positioning buttons as desired. The tactile cell assemblies in combination with the bused frame and the novel tactile pin cap for multiple cells enables self-alignment of the cells, thereby eliminating the additional alignment and securing requirements of the prior art.

Other features and advantages of the invention will become apparent or be described in connection with the following detailed description of the preferred embodiments of the present invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference should be made to the following detailed description, taken in connection with the accompanying drawings, in which:

FIG. **1**A is a perspective view depicting the interconnection between a Braille cell assembly and a frame;

FIG. **1**B is a perspective view like that of FIG. **1**A, further depicting three Braille cell assemblies secured to the frame;

FIG. **2**A is a top perspective view of the frame of the novel Braille display assembly;

FIG. **2**B is a bottom perspective view of the frame of the novel Braille display assembly;

FIG. **3** is a perspective view depicting the interconnection between the Braille cell and the frame top;

FIG. **4**A is a top perspective view of the novel cell cap;

FIG. **4**B is a bottom perspective view of the novel cell cap;

FIG. **5** is a perspective view of the frame bottom;

FIG. **6** is a perspective view of a novel set of buttons;

FIG. **7** is a perspective view of the novel double decade Braille display assembly absent the cell cap; and

FIG. **8** is a perspective view of the novel double decade Braille display assembly with the cell cap.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1**A depicts a Braille cell assembly **40** mounted on backplane **44** and FIG. **1**B depicts a plurality of said Braille cell assemblies mounted on said backplane. Braille cell assembly **40** includes printed circuit board **36** to which a plurality of piezoelectric element reeds are secured. A plurality of printed circuit board-receiving sockets **42** are mounted on backplane **44** in spaced relation to one another as depicted. A large number of Braille cell assemblies **40** may therefore be mounted to said backplane as suggested by FIG. **1**B. The present illustration shows the piezoelectric element reeds secured to the printed circuit board utilizing clip **30**, however this is not meant to be limiting and other Braille cell assemblies having a variety of configurations are within the scope of the invention.

In addition to providing independent support for the individual Braille cells, the backplane of the present invention also provides means for busing multiple backplanes together, thereby providing a multiple line Braille display. As shown with reference to FIG. **4**B, the backplane includes a connector **17** at one edge and a socket at the opposite edge **15**. The socket and connector combination provides an interconnect within the backplane to allow multiple Braille display assemblies to be bused together. With this novel interconnect configuration, the number of Braille cells used in this modularized design could consist of any multiple. In a particular embodiment, the level of modularization was carefully selected to match a minimum size display of twenty cells. By designing each module to interconnect through busing of the backplanes, modules can be cascaded to create a twenty, forty, sixty or eighty cell Braille display. Additional sizes are also within the scope of the invention, including a four cell and twenty cell module interconnected to provide a forty-four, seventy-two, or eighty-four cell Braille display. Additional logic circuitry is provided on the backplane to control the cursor and navigation buttons without relying on hardwiring from the Braille cell PCB to a cell cap.

FIG. **2**A is a top perspective view of frame **60** and FIG. **2**B is a bottom perspective view thereof. Frame **60** includes backplane **44** (see FIGS. **4**A and **4**B) and bottom wall **46**. It also includes an angle wall **62** having a plurality of sets **64** of pinholes or bores **66** formed in a horizontal part thereof. The horizontal part of angle wall **62** abuts a leading edge of backplane **44** and is coplanar therewith. Each pinhole or bore **66** is adapted to slideably receive a pin, not depicted in FIGS. **7**A and **7**B. The embodiment illustrated is for a Braille display having twenty individual Braille cell assemblies. As such, there are eight (8) pinholes or bores **66** per set **64** of pinholes or bores.

As shown in FIGS. **2**A and **2**B, upstanding flat wall **68** abuts a trailing edge of top wall **44** and a trailing edge of bottom wall **46**. A plurality of slots **70** are formed in the lower edge of said flat wall **68**. Each slot engages a projection formed in the trailing end of its associated Braille cell assembly. A corresponding plurality of slots **72** is formed in backplane **44** to accommodate the respective leading ends of the Braille cells. Each set of slots **70** and **72** cooperate with one another to provide a mount for each Braille cell **36**.

FIG. **3** depicts frame **60** when a Braille cell **36** is mounted in each slot **70**. It also depicts a Braille tactile pin **80** disposed in each tactile pin hole or bore **66**. One (1) bimorph reed **20** is associated with each tactile pin **80**, there being one Braille